Ford Motor Company

Kelly M. Brown
Director
Vehicle Environmental Engineering

Fairlane Business Park 4, Suite 145
17225 Federal Drive
Allen Park MI 48101

Docket Management
National Highway Traffic Safety Administration
Room PL-401
400 Seventh Street, S.W.
Washington D.C. 20590

May 8, 2002

Subject: Request for Comments: National Academy of Science Study and Future Fuel Economy Improvements, Model Years 2005-2010

Docket Number: 2002-11419

Ford Motor Company's (Ford) appreciates the opportunity to comment on the National Highway Traffic Safety Administration's (NHTSA) Request for Comments dated February 7, 2002 regarding light truck average fuel economy standards for model years 2005-2010. This submission supplements the comments submitted by the Alliance of Automobile Manufacturers and contains information that is unique to Ford.

This submission contains the non-confidential information of the Ford response. Three (3) copies of the confidential version have been submitted to the Office of Chief Counsel. Two (2) copies of the non-confidential version are being forwarded to the NHTSA Docket separately.

We will be pleased to discuss this information with you or members of your staff. Should you wish to do so, please contact me at 313-322-0033 or Walt Kreucher at 313-845-8247. Questions regarding our request for confidentiality should be addressed to Mark Edie, Office of the General Counsel, Ford Motor Company Limited, Room 706-A5, World Headquarters, The American Road, Dearborn, MI 48126-2798; telephone (313) 248 2355.

Sincerely,

Kelly M. Brown

cc The Honorable Jeffrey W. Runge, MD
Administrator

Enclosures

DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
49 CFR Part 533 [Docket No. 2002-11419] RIN 2127-AI70
Request for Comments
National Academy of Science Study and
Future Fuel Economy Improvements Model Years 2005-2010

Ford Motor Company recognizes the difficult task that the National Highway Traffic Safety Administration (NHTSA) is undertaking in this information gathering exercise. We want to assure NHTSA that we are committed to working with you on this journey towards technologically feasible and economically practical regulations given the risks inherent in other governmental standards and the nation's need to conserve energy.

Q.1. The NAS Study found that the CAFE program, as currently structured, has contributed to traffic fatalities and injuries. As an agency whose primary responsibility is safety and is therefore deeply concerned about the NAS finding, NHTSA requests comments on this NAS finding. Among our questions are: Is the safety impact understated or overstated? Would NAS' proposed changes to CAFE reduce this safety penalty? Could CAFE standards be modified so that manufacturers are encouraged to achieve improved fuel economy through application of technology instead of through downsizing and downweighting? NHTSA requests comments on the extent to which increases in light truck fuel efficiency are feasible during MYs 2005-2010 and on whether any of these increases would involve means -- such as significant weight and size reduction -- that could adversely affect safety. We note that the NAS found that if future weight reductions occur in only the heaviest of the light-duty vehicles, that can produce overall improvements in vehicle safety. If there would be adverse effects, how could they be mitigated?

Answer:
We agree with the comments submitted by the Alliance. In addition, recommendations for a weight-based standard are found in our answer to Question 10.

Q. 2. What is the technological feasibility and economic practicability of various fuel efficiency enhancing technologies that fall under the general headings of engine, vehicle and transmission technologies?

Answer:
Technologies that increase fuel economy and provide value to the customer have already been implemented and will continue to migrate into production with or without changes to the CAFE standard. The pace of the migration depends on development progress and customer demand that is predicated at least in part on fuel prices

Not all of the improvements in fuel economy technology can be effectively applied to trucks without seriously compromising their utility. For example, significant downsizing and weight reductions can compromise the payload, towing, and durability requirements that our customers dictate. Similarly, front wheel drive cannot be used effectively on most light trucks because customer requirements for cargo carrying and trailer towing would be compromised.

The detailed data on the near term and emerging technologies are found in Attachment Q.2.

Q. 3. What is the cost-effectiveness of each technology identified in Question 2, as well as any other relevant technologies, assuming alternative plausible gasoline prices forecast for MY 2005-2010, and assuming alternative payback periods ranging from 3 years to 10 years?

Answer:
In order to address this question, we employed the same methodology as was used by the National Academy of Sciences (NAS) in their January 2002 report entitled "Effectiveness and Impact of Corporate Average Fuel Economy (CAFE) Standards." The methodology is described in Chapter 4 of the report. We analyzed both Case 1 assumptions for a 14-year payback (12% discount rate) and Case 2 assumptions for a 3-year payback (undiscounted). For completeness, we evaluated three fuel price scenarios: $1.00 per gallon, $1.50 per gallon (as used by NAS), and $2.00 per gallon. The results of this analysis are shown in Attachment Q.3. We substituted our technology cost and fuel economy benefit information into the NAS

equations to determine the impact. When we used our cost and efficiency estimates, the model predicted significantly lower technologically feasible and economically practicable fuel economy values. We believe this is due to the errors in the cost and effectiveness assumptions that NAS utilized, as well as other errors (double-counting), as documented in the Alliance comments. The variable and investment costs for each of the technologies listed in Question 2 are found in Attachment Q.2. The cost-effectiveness for each individual technology can also be found in Attachment Q.2.

Q. 4. Taking into account the response to Question 2, and the statements recently made by Ford and General Motors about the fuel economy of their vehicles by 2005, and DaimlerChrysler's response, indicate the ability of each manufacturer to improve its light truck CAFE for each model year during the MY 2005-2010 timeframe. Specify the fuel economy improvements on a vehicle-by-vehicle basis that will result in the achievement of the manufacturers fuel economy pledges. For each vehicle, please list the specific technologies that will be employed and the increase in fuel economy attributed to such technology. By what model year would maximum penetration of all current fuel economy enhancing technologies be feasible? Why wouldn't such maximum penetration be feasible earlier than that model year?

Answer:
On July 27, 2000, Ford Motor Company announced that we planned to increase the fuel economy of our Sport Utility Vehicle (SUV) fleet in the United States by 25 percent by the 2005 calendar year. Our plan calls for a combination of significant improvement in the existing fleet and the introduction of new products with higher fuel economy capabilities. The commitment uses the 2000 model year as a base and ends in the second half of the 2005 calendar year with the 2006 model year products.

Attachment Q.4 contains the list of vehicles included in this commitment and the technologies Ford Motor Company plans to implement. Please note that the commitment covers vehicles that are included in CAFE plus a few models that are not included in CAFE calculations.

The timing of the technologies Ford Motor Company plans to use to achieve this commitment is based on the product cycle and availability of resources to incorporate the technology into production. Not all of the technologies can be applied across the fleet due to the capability of the technology, vehicle utility, and costs. For example, CVT application is limited to smaller vehicles, and cost and implementation issues limit hybrid penetration.

It is important to note that this commitment represents a significant challenge to Ford. However, as significant as this commitment is, it represented only a [ ][c] increase in our light-truck CAFE. Increased sales of full-size trucks could erode our CAFE estimates in spite of this commitment. This is one of the fundamental challenges inherent in the current CAFE system. Performance is dictated by what our customers purchase and not what we offer. We are committed to offering customers a range of choices when it comes to models that suit a range of lifestyles.

Q. 5. What analyses of manufacturer light truck fuel economy capabilities for MY 2005-2010 are available? What are the strengths and weaknesses of each such analysis?

Answer:
Please refer to the Alliance response for the answer to this question.

Q. 6. What data are available on the usage characteristics of light trucks, i.e., how many passengers and/or how much cargo the different types of light trucks typically carry? What survey and other data are available on the importance that consumers place on the fuel economy of light trucks relative to other vehicle attributes?

Answer: The customer survey data available to Ford indicate that customers who buy cars and customers who buy light trucks - SUVs, minivans, and pickup trucks - have very different needs and expectations of their vehicles. Light truck buyers are far more likely to need a vehicle to transport people, tow trailers, carry cargo, and venture off-road for recreational or work related purposes. Because of their specific needs, light truck owners value certain vehicle attributes more than car buyers. They tend to put an emphasis on the utility of their vehicles, looking for characteristics important for hauling and transporting people. Attributes such as cargo capacity, passenger seating capacity, and interior roominess take priority over fuel economy.

[c] – Confidential Information

Car buyers, in contrast, place a higher importance on fuel economy because they do not need their vehicles to perform the same tasks as a light truck buyer would require. In short, different vehicle needs and usage characteristics result in different purchasing priorities.

Customer Survey Data Sources
One source of customer survey data available to Ford is a 2001 customer satisfaction survey administered by an outside marketing research firm. The purpose of this survey, known within Ford as the New Vehicle Customer Study (NVCS), is to determine customer demographics, owner loyalty, reasons for purchase/lease, levels of satisfaction with a variety of features, other vehicles considered, and other vehicles in the household. The eight-page survey is sent to United States vehicle owners after three months of new vehicle ownership. The 2001 survey was a national sample of 83,196 principal drivers of all brands of vehicles bought or leased new in December 2000 and January, February, and March, 2001. Vehicle lines are quota sampled to yield approximately 250 buyers and 125 lessees for each vehicle.

Another source of data is Ford's Global Portfolio Structure (GPS) survey. There were 12,779 responses to the 2001 GPS survey from U.S. owners of all brands of vehicles. The GPS survey sample quota was based on an industry sales mix.

Light Truck Customer Usage Characteristics
Attachment Q.6, Figure 1, shows the percentage of respondents to the NVCS who use their vehicle for hauling, hunting/camping/fishing, or towing. The data show that light truck owners use their vehicles for different purposes than do car owners. Very few car owners - less than 5% - use their vehicles for any of the four "work" tasks, while many light truck owners need their vehicles to perform these functions. In addition to consumers using personal trucks for "work" tasks, the NVCS shows that 23% of truck, SUV, and full-size van owners, and 40% of over 8500# truck buyers, use their vehicle in their line of business, indicating that these vehicles are not only important in their personal lives, they are vital tools on the job as well.

The data from the GPS survey correlates with the NVCS results, showing that light truck customers have different vehicle needs than car buyers. Survey respondents were asked how often they use their vehicles for a variety of specific purposes. The percentage of car owners and light truck owners who need to perform the listed tasks at least monthly are shown in Attachment Q.6, Figure 2. Again, there is a significant difference in usage characteristics, with light truck buyers using their vehicles to transport their families, tow, and carry cargo much more frequently than car buyers. Thus, while customers do not use all the utility of trucks every day, it is clear that they are purchasing these products to fulfill their need for these extra features.

The Importance of Fuel Economy
Fuel prices are a primary factor in influencing to what degree vehicle buyers value fuel economy compared to other vehicle attributes, and therefore play a large role in vehicle purchasing decisions. As fuel prices increase, a greater percentage of the population buys cars, and when gasoline is less expensive, more people buy trucks, as shown in Attachment Q.6, Figure 3. Truck sales as a percentage of the retail vehicle market decreased during the late 1970's in response to increasing fuel prices, but have been rising since then as gasoline prices have generally been on a downward trend.

As discussed above, people who purchase light trucks have different needs than people who drive cars. This causes them to value utility-related vehicle attributes more highly than car buyers. In general, as the driver's utility requirement increases, the vehicle size goes up and the importance placed on fuel economy decreases. Light truck buyers are more interested in how well a vehicle fulfills their people and cargo hauling needs than in fuel economy, and they are buying SUVs and light trucks to meet specific transportation needs.

The survey data available to Ford emphasize the fact that most consumers select vehicles that best serve their peak uses, and light trucks must be capable of meeting these needs. Light trucks are purchased because of their superior utility, and therefore cannot and should not be subject to the same utility limiting CAFE standards as cars.

Q. 7. By their nature, fuel economy standards lower the marginal cost of driving. What effect does this cost difference have on vehicle miles traveled?

Answer:
Please refer to the Alliance comments for the answer to this question.

Q. 8. To what extent are other Federal standards likely to affect manufacturers' CAFE capabilities in MYs 2005-2010? Answers to this question should include not only the effects of such standards when first implemented, but also the prospect for reducing those effects subsequently.

Answer:
Please refer to the Alliance comments for the answer to this question.

Q. 9. In setting CAFE standards, the agency takes into consideration that there are often technological risks associated with actually achieving the full potential fuel economy improvement from a particular type of technology. How should the agency take technological risks into account in setting these light truck CAFE standards? What technological risks are associated with gaining the full potential fuel economy improvements from any of the available types of fuel economy enhancing technologies? What are the prospects for overcoming those risks or offsetting their effects on CAFE capability?

Answer:
NHTSA must take technological feasibility into account when setting light truck CAFE standards by considering both the probability that the technology may not be successful in meeting emissions, fuel economy or safety criteria, and the potential that the technology will be unacceptable to consumers. Areas of technical risk include:

- Customer Acceptance
- Timing
- Technology Interaction and Attribute Trade-offs
- Program Specific Risks
- Competing Resource Priorities

Customer Acceptance
As noted in a previous response to NTHSA dated August 3, 1994, consumer demand is a major determinant of commercial viability, and therefore a measure of economic practicability. Therefore, an evaluation of technological risk should include the potential that the technology will be unacceptable to consumers. Further compounding this risk is the inherent limited demand from consumers for more fuel-efficient vehicles. The NAS Report, "Effectiveness and Impact of Corporate Average Fuel Economy (CAFE) Standards," (2002) stated that consumers have a wide variety of opportunities to exercise their preference for fuel-efficient vehicles if that is an important attribute to them. Consumer choice is demonstrated not only in the increasing percentage of light trucks in the fleet, but also in the selection of options within a product line-up, particularly the selection of larger displacement engines.

Our experience at Ford has also shown that consumer willingness to pay for fuel economy improvements is limited. While an overhead cam, 4-valve engine can provide better fuel economy than a comparable 2-valve engine, the average consumer may not understand the technological differences between the engines, and will be reluctant to pay for the fuel economy benefit.

Incentives are of limited benefit as well. Using incentives to encourage consumers to purchase vehicles equipped with 4-cylinder engines results in those customers being less satisfied than customers who choose the V6 equipped vehicles. Incentives may encourage sales, but may ultimately reflect poorly on future customer satisfaction surveys.

Timing
In considering whether a particular technology will be successful, the first step is to evaluate whether the technology will be commercially available to aid in meeting a CAFE standard for a particular model year. New efficiency enhancing technologies are implemented at major change points, such as during major model freshenings or new vehicle programs. Change points in the cycle plan are determined by human

resource constraints and capital requirements. Out-of-cycle changes are very expensive and disrupt other programs, potentially delaying the introduction of new products. As a consequence, when fuel economy technologies underachieve relative to expected benefits, these shortfalls will be carried through to the next available change point. Further technology optimization efforts or the addition of more technologies are then assessed and implemented as required to meet vehicle program fuel economy targets.

For emerging technologies, there is a risk in basing regulatory requirements on engineering breakthroughs. Timing for taking theoretical ideas to working prototypes and to production capability does not follow a fixed path, and could vary as it is implemented over many vehicle programs given the variety of system interaction possibilities.

Technology Interaction and Attribute Trade-offs

An ongoing challenge in assessing the full potential of bundles of fuel economy actions is determining whether the improvements are additive or if there are interactions that reduce the total effects of the technology bundle. Answers to Question 16 address this in regard to the three paths in the NAS report.

The current state of analytical models and component testing capabilities results in a large range of variability when trying to predict and verify the benefits of multiple technologies. In addition, once technologies reach the implementation stage on actual vehicles, unanticipated functional interactions are often encountered requiring many compromises to achieve overall vehicle acceptability.

Program Specific Risks

Technological risks exist for implementing and achieving the full potential of fuel economy improvement technologies on a program-by-program basis. First, programs with different customer targets will implement technologies that meet their specific customer wants. Second, fuel economy improvement technologies are often measured as stand alone actions and not part of a vehicle system. Finally, competing requirements can limit fuel economy improvement benefits.

To illustrate the first point, consider a minivan and a full size pickup currently powered by a 2V V6 engine and a four-speed transmission. The fuel economy benefit improvement, as a percentage, to each vehicle of a 4V engine and five-speed transmission is likely to be different given the consumer's expectations and valued attributes for each vehicle.

Likewise, bench testing and vehicle results can differ, especially across a wide spectrum of vehicles. On a recent Ford program, the addition of linear intake variable cam timing (VCT) and electronic throttle control was expected to improve fuel economy by [ ][c], which was verified on a mini-map of the engine. However, implementation into the vehicle yielded less than [ ][c], since much of the benefit was lost to maintain other attributes at levels acceptable to customers.

Another example is future truck plans calling for a powertrain upgrade to a [ ][c] transmission. On one program the predicted fuel economy improvement was [ ][c]. However, the assumptions utilized assumed differing idle fuel flows and shift schedules. Once incorporated into a prototype vehicle, the overall benefit realized was [ ][c].

Phase-in plans for other regulatory standards can reduce the fuel economy of specific programs. Meeting safety requirements has been a major contributor to the increasing mass of vehicles, also reducing fuel efficiency.

Competing Resource Priorities

An additional technical hurdle to achieving the full potential of fuel economy improvements centers on engineering resource allocation. Regulatory and competitive actions can force technical capability to be focused on areas other than improving fuel economy. Mandated regulatory actions - safety and emissions in addition to CAFE - require engineering resources to be allocated toward meeting the standards. Competitive actions also can strongly influence resource utilization given the need to respond to consumer demand for the latest features (third row seats on SUVs, power doors on minivans, heated and cooled seats) or improved safety ratings (5-star crash). In order for an automotive firm to remain economically viable, all of these factors must be addressed.

[C] – Confidential Information

Overcoming the Risks
First, costs associated with fuel economy improvements will need to be offset elsewhere in the vehicle. Consumers have not shown a willingness to pay for them and the current automotive market is highly cost competitive. Second, it is difficult to assess the impact of the technology interactions for improving fuel economy. Third, it is difficult to assess the percentage of the fleet that will implement the actions and the timing for those that do. Finally, projecting engineering resource requirements for regulatory and competitive actions into the future is difficult.

At Ford we have found that our initial estimates of fuel economy improvements are typically 40-60% higher than the improvements that ultimately result on the production vehicles. To account for these risks, Ford degrades CAFE projections for future model years (2005 and later) by [ ][c] for CAFE planning purposes. The agency should assume at least the same level of loss from anticipated improvements when basing future light truck standards on analytical projections of fuel economy benefits.

Q. 10. Please comment on the idea of an attribute-based system. Provide feedback on which attribute(s) such a system should be based on and the specific classes of vehicles that might fall under each class. In addition, please suggest the fuel economy level associated with each specific class of that attribute-based system (e.g., vehicles weighing from 2,000 lbs. GVWR to 2,500 GVWR would have to meet an average of xx.x MPG).

Answer:
Attribute-based systems, if properly structured, could reduce the disparate impacts and mitigate the safety impacts of the current CAFE system. The goal in designing such a system would be to define a fair and equitable system to distribute the fuel savings more evenly among manufacturers who produce vehicles that provide different levels of utility and functionality.

In recent studies, vehicle weight has been shown to have the best correlation to vehicle fuel consumption. When other attributes were combined with weight, such as interior volume or footprint, the correlation significantly decreased. In addition, because of the many differences between cars and trucks, such as the ability to adopt certain technologies due to unique utility, targets for trucks should not be the same as for cars.

Properly structured weight-based standards require improved vehicle efficiency regardless of vehicle size or weight, with manufacturers treated the same regardless of sales mix. This approach focuses on improvements in powertrain efficiency and aerodynamics while protecting the utility and functionality of all categories of vehicles.

Some of the characteristics of any well-designed system would include:
- Simple (easy to understand and implement)
- Allows sufficient lead time
- Robust (allows manufacturers to respond to the market)
- Requires similar tasks for all manufacturers
- Does not degrade safety
- Saves energy

If an attribute system is developed, care must be taken to avoid creating an overly burdensome system. In addition, the advantages of a weight system would be overshadowed if this system were implemented on top of today's CAFE program.

Q. 11. Please comment on the possibility of tradable fuel economy credits and the potential cost and benefits to each manufacturer.

Answer:
We do not envision an inter-manufacturer trading system that would work since it would inevitably lead to transference of wealth from full line manufacturers to foreign companies who provide small vehicles unless equitable tasks are developed for all manufacturers. A credit trading approach would require fuel economy standards that provide a level playing field so that no manufacturer is given an inherent initial advantage and the potential to enrich itself through the sale of credits. In addition, we believe the government would need

[C] – Confidential Information

to be the seller of last resort so that manufacturers would not be forced to bargain directly with one another over credit transfers. There are many downsides to providing funding to competitors in exchange for CAFE credits, even indirectly. If the intent of the regulation is to reduce the fuel consumption and fuel dependence of the United States, the beneficiary of any credit payment should be the government and not a competing manufacturer. Ford would not likely use a scheme that required Manufacturer A to directly compensate Manufacturer B.

For the reasons discussed above, Ford does not believe that a credit trading scheme would provide significant relief from CAFE standards. Trading schemes MUST NOT be used to support any incremental increase in standards.

Q. 12. Please comment on the effect that elimination of the two-fleet rule would have on manufacturers, consumers, employment, the U.S. marketplace, and on the automotive industry in general. The elimination of the two-fleet rule, providing for a domestic passenger car fleet and an import passenger car fleet, has been suggested as a possible modification to CAFE. The distinction is based on the proportion of the car's value that is defined as being domestic; an import is defined as a car with less than 75 percent domestic content. If a manufacturer has both a domestic passenger car fleet and an import passenger car fleet, each fleet must separately meet the passenger car standard. If this rule were eliminated, such a manufacturer could place all its passenger cars in a single fleet.

Answer:
The domestic/non-domestic passenger car CAFE fleet distinction was never intended to have an impact on fuel economy. This issue was brought forth by the American labor unions as a method of protecting jobs. Ford respects the opinion of our union workers on this issue.

Q. 13. Please provide suggestions for modifications of the vehicle classification. These suggestions should be as detailed as possible and should state the logic and rationale for the modification, as well as suggested definitions. An analysis of the pros and cons of each suggested modification should also be provided.

Answer:
Our response to Question 6 demonstrates that there are distinct differences between the usage characteristics and priorities of light truck and car owners. Light trucks, including SUVs, are purchased and used for different purposes than cars, including towing, hauling, cargo carrying, and transporting large groups of people, so they should not be subject to the same fuel economy standards. The utility and use differences between cars and light trucks must be carefully considered prior to implementing any vehicle classification modification.

One modification suggested by some that has a number of associated problems is removing SUVs, minivans, and Multi-Activity Vehicles (MAVs) from the truck fleet and including them in the car fleet or creating a third category. This modification would negatively impact both car and truck CAFE compliance, and may have negative safety consequences as well.

Removing SUVs, minivans, and MAVs from Ford's truck CAFE fleet and adding them to the car fleet would degrade both the truck and car CAFE results. CAFE for Ford light trucks under 8500 lbs. would be decreased by approximately [ ][c] mpg in 2006 and [ ][c] mpg in 2010. Combining SUVs, minivans, and MAVs with the car fleet would degrade the car CAFE results by [ ][c] mpg and [ ][c] mpg for 2006 and 2010, respectively. This degradation in the car fleet fuel economy average could potentially lead to downsizing and reducing the average vehicle weight of the car fleet, which could have negative safety implications. Additionally, there would need to be a significant amount of lead-time for manufacturers to make the necessary adjustments to address such a classification change. A great deal of time, money, and engineering resources would have to be expended by the manufacturers in order to bring the truck and car/SUV/minivan/MAV fleets back into compliance. It is likely that compromises would have to be made which would negatively affect both vehicle safety and consumer choice.

Moving SUVs from the truck fleet to the car fleet would also adversely impact the relative competitiveness of automobile manufacturers. Manufacturers who provide larger SUVs to serve customers with more demanding utility needs would be unfairly burdened compared to manufacturers with a product line limited to smaller SUVs. To demonstrate how this type of proposal would have a disparate impact on certain

[C] – Confidential Information

manufacturers, the CAFE results for a 2001 domestic combined car, SUV, minivan, and MAV fleet were calculated. Assuming the CAFE standard for the combined fleet would be set at 27.5 mpg, Ford, GM, and DaimlerChrysler would all be well below the standard, with CAFE results of approximately 24, 25, and 23 mpg, respectively (excluding FFV, carryback, or carryforward credits). Honda and Toyota, due in large part to their more limited product lines, would achieve fleet averages of approximately 32 and 29 mpg, respectively. (Note: Trucks are not currently classified as either domestic or import. In cases where a Honda or Toyota SUV's domestic/import status was unclear, it was classified as domestic to model the "worst case" impact on their combined fleet CAFE results.) Setting a standard at the level of the least capable manufacturer would allow other competitors to degrade their CAFE performance.

Another approach advocated by some would be to combine all vehicles under 8500 lbs. - cars, SUVs, minivans, MAVs, and pickups - under a single CAFE requirement. This scenario would also present multiple issues.

The primary drawback would be that full-line vehicle manufacturers who build a complete array of light trucks and cars would have a competitive disadvantage compared to manufacturers with product lines that focus more on passenger cars. A passenger car-focused manufacturer would be able to take advantage of its CAFE surplus to build more powerful, and hence less fuel efficient, vehicles to obtain market share in a certain market segment, leaving the CAFE-limited full-line manufacturer at a competitive disadvantage. While this system would allow some added flexibility to trade credits within a given manufacturer's product line, its inherent unfairness makes it an undesirable program. The bottom line is that a system that rewards a small manufacturer for producing a larger vehicle while penalizing a full-line manufacturer for producing the same vehicle does not help fuel conservation and thus must be avoided.

Ford recommends that the current vehicle classification system, which separates cars from light trucks, must be maintained. The current system was put in place because the CAFE legislation's authors recognized that the more demanding utility requirements on light trucks made them unable to meet the same fuel economy standards as cars, and the same applies today.

Q. 14. Please provide comments on the possibility of raising the maximum gross vehicle weight rating and on the effects that this would have on manufacturers, consumers, U.S. automotive industry employment and the automotive industry in general. Another possible modification to the CAFE program would be raising the maximum gross vehicle weight rating of vehicles covered by the CAFE standards from 8,500 lbs. to 10,000 lbs. Manufacturers currently are selling several models of large sport utility vehicles over the 8,500 lbs. weight limit that are being utilized as passenger vehicles. Because the gross vehicle weight rating is based on manufacturer supplied information on the load carrying capacity of their vehicles, the agency is concerned that some vehicles, which are primarily used as passenger vehicles, are not included in manufacturers' light truck fleets. The agency has the statutory authority to make this change.

Answer:
Please refer to the Alliance response for the answer to this question.

Q. 15. NHTSA requests comments on the above possible modifications to the CAFE program and other modifications that have been discussed, such as those mentioned in the National Academy of Sciences study. In addressing these possible modifications, please identify their positives and negatives; their estimated costs and benefits; their effect on manufacturers, suppliers, employees, and consumers; and the policy implications of each. The agency requests that each manufacturer specify how much lead time would be needed to respond to each possible modification and provide that information in terms of product planning cycles. To assist NHTSA, please be as specific as possible and provide any information that you believe will be helpful.

Answer:
Please refer to the Alliance comments for the answer to this question.

Q. 16. In examining the three paths (from NAS Study) that were chosen, please comment on whether they represent likely scenarios for technology bundling. If not, please comment on which technologies are likely to be bundled together and please identify the specific vehicle types and vehicles/models that might include them. In addition, please comment on the technologies already included on the vehicle types/models, the projected vehicle weight and the percent of total model sales anticipated for each model (i.e., CVT - 45%, 5-Speed Automatic - 40%, 5-Speed Manual - 5%). Finally, please comment on the assumptions the NAS made in evaluating the three paths. Are there more plausible alternative assumptions?

Answer:
While there was some logic to the bundling of technologies into the three NAS paths individually, the order in which the technologies were applied in the cost-effectiveness analysis was not realistic. Some of the technologies listed in the paths are dependent on each other and need to be ordered by feasibility and then by cost-effectiveness. Regarding feasibility, the 42-Volt technology is required for electric power steering, integrated starter generator and camless valve actuation. Therefore, the 42-Volt battery must precede each of these three technologies. Similarly, the multi-valve/OHC technology is desirable for variable valve timing and variable valve lift and timing. It is crucial that technologies are ordered correctly with respect to feasibility before a cost-effectiveness analysis is conducted.

As outlined in our response to Question 2, Ford believes that the bundling, cost and benefit assumptions analyzed by NAS are not reflective of current state-of-the-art. Ford has undertaken an effort to complete an analysis comparable to the one conducted by NAS in Chapter 4, using the same methodology. We have input our technology costs and the expected fuel economy improvement potential. Based on our re-analysis of the consumer benefits of fuel-efficient technology, we believe that a technologically feasible increase in the light truck standard can be justified as economically practicable. In conducting this analysis, Ford updated the baseline fuel economy capabilities for the various technologies used by NAS to reflect technology currently implemented by Ford.

For example, in 2001, 14.3% of our total truck volume, including the Escape, Tribute, 2.3L Ranger/B-Series and MPV, had four valves per cylinder. The 2002 5.4L Blackwood is added to the list of trucks with a four valves per cylinder engine. The five-speed automatic transmission comprised 27.9% of our 2001 truck volume, including vehicles such as the 2.3/3.0/4.0L Ranger/B-Series, Explorer/Sport/Sport Trac, Mountaineer, and Volvo V70XC. In 2002, the MPV also included the five-speed automatic transmission. Additionally in 2001, the 4.0L Explorer/Sport/Sport Trac, 2.3L Ranger/B-Series and all 4.6L and 5.4L vehicles included overhead cam engines. The percent breakdown included 55.5% of total volume using single overhead cam (SOHC) and 1% using dual overhead cam (DOHC).

Q. 17. Should hybrid and fuel cell vehicles have been included in the paths? If so, which ones and which specific vehicle types? What technologies would be included with these types of vehicles?

Answer:
NAS correctly eliminated hybrid and fuel cell vehicles from their cost-effectiveness analysis. Though some hybrids are on the road or scheduled for introduction in the near future, there are significant barriers that must be overcome before full-scale application of this technology can be adopted. The NAS study on page 53 cited several of these barriers that include:

- Warranty periods (including battery warranty)
- Rate at which the battery can accept energy
- Safety consequences of depleted batteries

The barriers of fuel cell technologies are even greater. Currently, only prototype fuel cell vehicles are on the road. The technology for use in vehicles is still in the development stages, and significant work will need to be done to develop a system that is efficient and cost-effective. The new FreedomCAR program is designed to focus on long-term research and development of fuel cells and moving toward a hydrogen infrastructure. We see the development of an infrastructure as a major barrier to the incorporation of fuel cell vehicles in the on-road fleet.

Inclusion of advanced technologies in the new vehicle fleet will not significantly improve the fuel economy of the in-use fleet for at least twenty years. Until the affordability issue of hybrid electric vehicles is addressed, these vehicles will not provide any net savings to customers.

Q. 18. Do you believe that the NAS study over or under estimated the fuel economy benefits from specific technologies? If so, which ones and why? Please provide NHTSA with your data that suggest a different benefit resulting from the application of these technologies.

Answer:
We agree with the Alliance assessment of the NAS Study. Ford Motor Company's estimates of the fuel economy benefits as compared to NAS's estimates are found in Attachment Q.2.

Q. 19. Do you agree with the figures derived in the NAS break-even analysis? If not, why? Please address specific areas of differences, explain your reason(s) why, and provide supporting data for your reasons and arguments.

Answer:
As shown in our answer to Question 3, we have updated the NAS break-even analysis using Ford data on technology cost and effectiveness. The differences are significant. Ford's analysis reflects a more probable outcome from this level of technology migration. In our analysis we included hybrid and other advanced technologies in the value curves. The net result of this inclusion is a lower estimated fuel economy given today's fuel price structure.

Q. 20. For the forthcoming rulemaking and future CAFE rulemakings, benefit analysis will play an important role in NHTSA decision-making. NHTSA therefore seeks comments on the following specific benefit issues: Can you provide, in addition to the material in the NAS report, any methods and data that would be helpful in identifying, quantifying, and expressing in dollar units the potential benefits of alternative CAFE standards (including energy security, environmental, and other considerations)? Are there any ancillary studies that NHTSA or other federal agencies should commission to provide a stronger technical foundation for making benefit estimates in future CAFE rulemakings?

Answer:
Ford has not done an independent analysis of the numerous studies of the externalities of fuel economy standards.

Manufacturer Data

III Q.1. Identify all light truck models currently offered for sale in MY 2001 whose production you project discontinuing before MY 2005 and identify the last model year in which each will be offered.

Answer:
Ford Motor Company [ ][c] prior to the 2005 MY.

III. Q. 2. Identify all basic engines offered by respondent in MY 2001 light trucks which respondent projects it will cease to offer for sale in light trucks before MY 2005, and identify the last model year in which each will be offered.

Answer: Ford Motor Company [ ][c] prior to the 2005 MY.

III. Q 3. Does the respondent currently project offering for sale for the time period of MY 2005-2010 any new or redesigned light trucks, including vehicles smaller than those now produced?

Answer: Attachment Q.III.3 contains the list of the light trucks Ford Motor Company plans to offer for 2005-2010 models years and their anticipated attributes.

Attachment Q.III.3.j contains the expected incremental and substitutional effects of new or discontinued vehicles in the 2005 through 2010 timeframe.

[c] – Confidential Information

III. Q. 4. Does respondent project introducing any variants of existing basic engines or any new basic engines, other than those mentioned in your response to Question 3, in its light truck fleets in MYs 2005-2010?

Answer: Attachment Q.III.4 contains the detail on our future engines.

III. Q. 5. Relative to MY 2001 levels, for MYs 2005-2010, please provide information, by truckline and as an average effect on a manufacturer's entire light truck fleet, on the weight and/or fuel economy impacts of the following standards or equipment:
a. Federal Motor Vehicle Safety Standard (FMVSS 208) Automatic Restraints
b. FMVSS 201 Occupant Protection in Interior Impact
c. Voluntary installation of safety equipment (e.g., antilock brakes)
d. Environmental Protection Agency regulations
e. California Air Resources Board requirements
f. Other applicable motor vehicle regulations affecting fuel economy.

Answer:
(a) **FMVSS 208**
The combined effect of changes to FMVSS 208 is anticipated to add [ ]^c lbs. per light truck. This includes increases to accommodate firm changes to the requirement, such as Stage 1 and Stage 2 of today's standard, as well as future projections, such as integration of the offset deformable barrier test mode. Projections indicate that the offset mode would be phased in during the model years of interest. The weight increases will result in a light truck CAFE effect of [ ]^c mpg for the 2005 model year.

(b) **FMVSS 201**
The interior head impact requirements of FMVSS 201 are estimated to add approximately [ ]^c lbs. per light truck. This estimate includes effects of redeployed grab handles [( )]^c, additional foam countermeasures [( )]^c, and associated fixing methods [( )]^c. The weight increases will result in a light truck CAFE effect of [ ]^c mpg for the 2005 model year.

(c) **Other voluntary safety equipment**
The addition of four-wheel antilock brakes as either an optional feature or as a standard method of complying with upcoming tire pressure monitoring requirements is estimated to add [ ]^c lbs. per light truck. The weight increase will result in a light truck CAFE effect of [ ]^c mpg for the 2005 model year.

The addition of an optional electronic stability technology feature (Advance Trac ™) is projected to add [ ]^c lbs. incrementally to the required ABS system. The weight increase will result in a light truck CAFE effect of [ ]^c mpg for the 2005 model year.

The currently optional side airbag system (protects both head and torso) adds approximately [ ]^c lbs. The weight increase will result in a light truck CAFE effect of [ ]^c mpg for the 2005 model year.

Future vehicles will employ the safety canopy system that includes rollover sensors as well as a side airbag curtain. The safety canopy system is projected to increase vehicle weight by approximately [ ]^c lbs. The weight increase will result in a light truck CAFE effect of [ ]^c mpg for the 2005 model year.

(d and e) **Environmental Protection Agency and California Air Resources Board requirements**
The Tier 2 and LEV II standards are not expected to have a direct, adverse impact on fuel economy, though it is too soon in the implementation process to rule out the possibility that additional components or larger versions of existing components (e.g. catalysts, NOx traps) may have to be added to meet the standards. However, as discussed previously in the Alliance's response to Question 8, more stringent emissions standards may prevent the use of more fuel-efficient engine technologies, such as gasoline direct-injection (GDI)/lean-burn, diesel engines, and even HEV technology.

<u>GDI/lean-burn</u>:
While gasoline vehicles with direct injection (GDI) can be operated at stoichiometry, fuel economy benefits are optimized when they are operated under lean conditions. Lean-burn GDI can improve fuel economy by 10-15%. "Conventional" technology vehicles can also achieve fuel economy improvements when operated

^{C} – Confidential Information

under lean conditions. However, lean operation requires new/breakthrough aftertreatment technologies in order to meet 2004MY and beyond NO_x and particulate emission standards. Effective use of these technologies in turn requires the availability of near zero sulfur fuel. Fuel sulfur is known to poison all aftertreatment systems, but it is especially harmful to non-stoichiometric aftertreatment systems such as NO_x traps. Sulfur compounds are approximately the same size and shape as NO_x compounds and are preferentially absorbed on the trap. In order to restore the trap to its original efficiency, the trap must undergo a period of rich-bias (increased fuel flow) under high temperature. These rich excursions ultimately harm the long-term durability of the trap and reduce the fuel economy potential for the lean-burn technology. This represents a fundamental challenge to successful implementation of the technology. Furthermore, as emissions standards become more stringent, advanced NO_x traps with significantly larger volumes are required, increasing the cost dramatically, making these vehicles less cost-competitive.

Diesel:
Clean, modern diesels using clean, high quality diesel fuel are a solution that is widely used in Europe. Diesel vehicles provide increased fuel economy compared to gasoline vehicles with equivalent attributes and product performance. This can be a 25-35% improvement in miles per gallon, depending upon the amount of city driving. However, the Tier 2 fleet NO_x average, as well as the SFTP emission requirements, require NO_x control technologies which have not yet been developed and demonstrated. Particulate matter emissions also require additional aftertreatment control. Each of these controls has a negative impact on fuel economy – both due to the added weight (1.5% increase in weight decreases fuel economy by 1.5%) as well as the impact they have on engine operation (e.g., increased backpressure). As with lean-burn gasoline vehicles, sulfur levels will greatly impact the efficiency of these aftertreatment controls, and efforts to even partially offset the affect of sulfur will in turn offset the fuel economy benefit. The cost of these technologies also makes the vehicles less competitive. Systems are being considered which will use urea to help control NO_x emissions. While urea systems do not appear to be sensitive to fuel sulfur levels, they do add significantly (3%) to the fuel price, adding an additional cost to this fuel-efficient technology. The retail infrastructure for urea also does not exist, and likely will not exist without some assurance of demand. At this time, we are not projecting that urea-based systems or clean diesels will be able to achieve Tier 2 emission standards in any significant volume.

Alternative fuel vehicles

- CNG/LPG: Bi-fuel, or dual-fuel, vehicles are largely seen as necessary "bridge" technologies to allow consumers to operate on clean, alternative fuels while not having to rely on the infant alternative refueling infrastructure. However, the stringent evaporative emissions requirements (CARB and EPA) are posing a huge obstacle to these technologies. Both agencies require bi-fuel gaseous-fueled vehicles to perform the evaporative emissions tests with both fuels aboard the vehicle. This requires two separate fuel systems to meet the standard, which is more of a challenge compared to single-fueled gasoline vehicles. The challenge of this requirement is becoming a significant obstacle to the certification of these products.

- Ethanol: The increasingly stringent tailpipe and evaporative standards pose a significant challenge to vehicles operating on this renewable fuel. Cold start emissions, always a problem for ethanol vehicles, become nearly prohibitive under the new standards. With respect to evaporative emissions, new technologies and materials will be needed to ensure that vehicles operating on this extremely polar and volatile fuel will adequately control emissions from permeation and from the canister. Canister size is limited by engine size. If canisters get too large with respect to engine size, they will cease to function properly and may cause problems with engine operation.

- Hybrid Electric Vehicles: HEVs offer dramatically decreased fuel consumption, albeit at a higher vehicle cost. However, the same attribute which makes them fuel-efficient is making compliance to the new, lower evaporative emissions standards difficult. HEVs operate most fuel-efficiently when they are operating on electric power. However, the drive cycle in the evaporative emissions test procedure is not sufficiently long to provide enough gasoline operation to adequately purge the evaporative emissions canister on the vehicle. Changing the calibration to operate the engine for longer periods during this drive cycle mode will negatively impact fuel economy.

III. Q. 6. For each of the model years 2005-2010, and for each light truck model projected to be manufactured by respondent (if answers differ for the various models), provide the requested information for each of items "6a" through "6o" listed below:
(i) description of the nature of the technological improvement;
(ii) the percent fuel economy improvement averaged over the model;
(iii) the basis for your answer to 6(ii), (e.g., data from dynamometer tests conducted by respondent, engineering analysis, computer simulation, reports of test by others);
(iv) the percent production implementation rate and the reasons limiting the implementation rate;
(v) a description of the 2001 baseline technologies and the 2001 implementation rate; and
(vi) the reasons for differing answers you provide to items (ii) and (iv) for different models in each model year. Include as a part of your answer to 6(ii) and 6(iv) a tabular presentation, a sample portion of which is shown in Table C.

Answer: Attachment Q.III.6 contains the detailed information on our future fuel economy technology. Technology implementation rates are limited by the availability of engineering resources. Many of the technologies considered by the NAS Study require development and prove-out from concept to implementation to production. Although engineers are accustomed to working on a few technologies at a time for implementation on specific vehicles, there is not enough manpower to develop and implement multiple technologies across our entire product lineup within a short period of time. Although technology rollout times vary in length, it often takes engineering resources between five and ten years to fully rollout a technology across all product lines. Added difficulty lies in the fact that much of the work associated with the technologies considered by the NAS must be absorbed solely by the powertrain (engine and transmission) organization. The fixed amount of engineering resources simply cannot contain the workload that would be required to rollout many technologies simultaneously across an entire fleet in a short period of time.

As noted elsewhere in our comments, all fuel-efficiency enhancing technologies cannot be applied to all light trucks without seriously compromising the utility of the vehicle. Existing attributes within a vehicle line may interact with new fuel enhancing technologies in a way that reduces the total effect of the technology. For example, front wheel drive cannot be used effectively on most light trucks because customer requirements for cargo carrying and trailer towing would be compromised.

III. Q. 7. For each model of respondent's light truck fleet projected to be manufactured in each of MYs 2005-2010, describe the methods used to achieve reductions in average test weight.

Answer:
Consistent with consumer demands, Ford has already incorporated many enhanced fuel economy technologies and improved the fuel efficiency of its light truck fleet while minimizing significant weight increases. While many of the technologies have contributed to significant improvement in fuel efficiency, they have not always resulted in improved fuel economy. In essence, the positive fuel economy contribution was offset by weight increases due to additional regulatory requirements or customers' preference for increased options.

Ford Motor Company is continuing to experience weight increases in the 2001 model year to 2005 model year period due to functional improvements in trucks (primarily NVH; durability; ride and handling; and safety/regulatory related improvements) as well as new option content driven by competition. These weight increases are across the board, with a truck fleet average of about [ ][c] pounds/year. In a given year, the introduction of a smaller vehicle, such as the Escape, might flatten the growth for [ ][c], but the growth resumes again as the market demands increased content and functional improvements new models. Over time, we expect ETW classes to continue their gradually rise.

Premium materials usage is growing, but is constrained by intense competitive cost pressures. For instance, the new 2003 Expedition has [ ][c] more pounds of aluminum and magnesium components than the 2002 model, but it weighs approximately [ ][c] pounds more. The added weight from functional improvements, increased content, and regulatory requirements more than offset the weight reductions from the premium materials.

In the 2005-2010 period, there will likely be an increase in the introduction of more fuel-efficient powertrains. In particular, the diesel mix may grow, provided we can solve the technical problems cited above. In

[c] – Confidential Information

addition, all of the major automotive manufacturers have publicly committed to one or more hybrid models. If diesels and hybrids are widely accepted by the public, then these heavier powertrains will likely increase the average vehicle weights through 2010.

Since we do not expect cost competition to abate during this decade, lightweight materials will continue to be introduced in cost-effective situations rather than across the truck fleet. The industry's CAE capabilities continue to improve, providing opportunities to optimize vehicle designs throughout the product development process.

Another positive trend is the continuing switch to lightweight electrical systems rather than mechanical systems. We think that these promising weight savings trends will tend to be offset by the weight growth from heavier, more efficient powertrains (diesels and hybrids), functional improvements, increased content, new features, and regulatory driven requirements.

III. Q. 8. For each model year 2005-2010, list all projected light truck model types and provide the information specified in "a" through "k" below for each model type.

Answer: Attachment Q.III.8 contains the model type data.

III. Q. 9. For each transmission identified in response to 8(d) above, provide a listing showing whether the transmission is manual or automatic, the gear ratios for the transmission, and the models that will use the transmission.

Answer: Attachment Q.III.9 contains the transmission characteristics.

III. Q. 10. Indicate any MY 2005-2010 light truck model types that have higher average test weights than comparable MY 2001 model types. Describe the reasons for any weight increases (e.g., increased option content, less use of premium materials) and provide supporting justification.

Answer:
Ford's goal is to maintain vehicle weights. However, the status for future model years is unknown and will depend on new regulatory initiatives, consumer wants, competitive pressures, and availability of cost-effective materials. More detail can be found in the answer to Question III Q. 7.

III. Q. 11. For each new or redesigned vehicle identified in response to Question 3 and each new engine or fuel economy improvement identified in your response to Questions 3, 5, and 6, provide your best estimate of the following, in terms of constant 1996 dollars:
(a) Total capital costs required to implement the new/redesigned model or improvement according to the implementation schedules specified in your response. Subdivide the capital costs into tooling, facilities, launch, and engineering costs.
(b) The maximum production capacity, expressed in units of capacity per year, associated with the capital expenditure in (a) above. Specify the number of production shifts on which your response is based and define "maximum capacity" as used in your answer.
(c) The actual capacity that is planned to be used each year for each new/redesigned model or fuel economy improvement.
(d) The increase in variable costs per affected unit, based on the production volume specified in (b) above.
(e) The equivalent retail price increase per affected vehicle for each new/redesigned model or improvement. Provide an example describing methodology used to determine the equivalent retail price increase.

Answers:
(a) See Attachment Q.III.11.a for a table of capital costs.
(b) See the answer to Question III Q. 15 for vehicle capacity. For powertrain capacities, see Attachment Q.III.11.b, Tables 1 and 2.
(c) See the projected volumes found in the answer to Question III Q. 3. for the actual capacity that is planned.
(d) See Attachment Q.2 for variable costs.
(e) Program specific work has not yet started for many of the vehicle programs for models that will be introduced or redesigned during the MY 2005-2010 time period, so it is not possible to predict what the retail

prices will be. In addition, some new models are not based on existing models, so there is no way to derive meaningful retail price increase values.

III. Q. 12. Please provide respondent's actual and projected U.S. light truck sales, 4x2 and 4x4, 0-8,500 lbs. GVWR and 8501-10,000 lbs., GVWR for each model year from 2001 through 2004, inclusive.

Answer: Production data for 2001 and forecasted volumes for 2002 through 2004 trucks are found in Attachment Q.III.12. The volumes for over 8500# GVW vehicles are estimates, as Ford Motor Company does not routinely track this class of vehicle to the level of detail requested.

III. Q. 13. Please provide your estimates of projected total industry U.S. light (0-10,000 lbs, GVWR) truck sales for each model year from 2005 through 2010, inclusive. Please subdivide the data into 4x2 and 4x4 sales and into the vehicle categories listed in the sample format in Table E.

Answer: Reference Attachment Q.III.13. Ford Motor Company does not forecast volumes by 2WD and 4WD.

III. Q. 14. Please provide your company's assumptions for U.S. gasoline and diesel fuel prices during 2005 through 2010.

Answer: Ford's projections of fuel prices are found in Attachment Q.III.14.

III. Q.15. Please provide projected production capacity available for the North American market (at standard production rates) for each of your company's light truckline designations during MYs 2005-2010.

Answer:
Projected North American production capacity is found in Attachment Q.III.15. As part of the Ford restructuring efforts announced this year, several changes will be made in our manufacturing plans over the next several years, including:

- Closing five plants: Edison Assembly, Ontario Truck Plant, St. Louis Assembly, Cleveland Aluminum Casting and Vulcan Forge
- Not identifying new products for Cuautitlan Assembly
- Pursuing the sale of Woodhaven Forging Plant

In addition, Ford plans major downsizing and shift reductions at 11 plants; and line speed reductions and changes to operating patterns at nine plants.

It should be noted that there are limited opportunities to change mix and technology options without incurring capital expenditures. Engine plants have fixed capacity that is linked to assembly plant capacity. Changing that capacity or shifting production to other plants will require careful system-wide planning and additional expenditure. In addition, forced mix changes to comply with standards could result in incremental sales loss when consumers choose to purchase other vehicles.

III. Q.16. Please provide your estimate of production lead-time for new models, your expected model life in years, and the number of years over which tooling costs are amortized.

Answer:
New model production lead-time varies depending on program issues and cycle plan timing. In general, it is between [ ][c] months from the time when work begins on a program until full-scale vehicle production begins. As a program progresses, the freedom to make design changes in response to regulatory changes and to compensate for changes in factors that determine fuel efficiency decreases, and the expense and risk incurred in making design changes rapidly increases.

By [ ][c] months prior to production, the program team has completed a plan to meet regulatory requirements and major customer wants, defined vehicle level target ranges and product assumptions, and identified any new technologies to be implemented.

[c] – Confidential Information

At approximately [ ][c] before production, design decisions affecting powertrain choice are solidified. The powertrain line-up is selected, and the powertrain package envelope is defined. Engineering design work on other vehicle subsystems and components then proceeds based on these design decisions. In addition, vehicle, system, and subsystem level targets are set. At this point it is nearly impossible to implement any major changes to address increases in fuel economy standards.

Model life varies from model to model depending on the market segment, competitive environment, and a number of other factors. For light trucks, the expected model life ranges from [ ][c] years.

Tooling cost amortization also depends on many factors. Vehicle tooling costs are capitalized on a vehicle line basis and amortized over the life of a vehicle line. For example, if a vehicle line was launched this year, and was planned for production for the next five years, i.e. the next major change to the program was in five years, the tooling costs would be amortized over a 5-year period. Vehicle line life varies from line to line. For planning purposes, the amortization is usually estimated to be approximately [ ][c] years for vehicle tooling and [ ][c] years for powertrain tooling.

If instability in regulation affecting fuel economy necessitates continual introduction of new technologies, tooling will have to be replaced more often, thereby reducing the length of time over which costs can be amortized. Therefore, it is desirable to make changes in fuel economy regulations as infrequent as possible to reduce this costly churn and to ensure that tooling can be kept in use long enough to pay for itself.

[c] – Confidential Information

The following attachments are confidential and are not included in this non-confidential submission:

Attachment Q.2
Attachment Q. 3
Attachment Q. 4
Attachment Q. 6, Figures 1 and 2
Attachment Q. III. 3
Attachment Q. III. 3. j
Attachment Q. III. 4
Attachment Q. III. 6
Attachment Q. III. 8
Attachment Q. III. 9
Attachment Q. III. 11. a
Attachment Q. III. 11. b
Attachment Q. III. 13
Attachment Q. III. 15

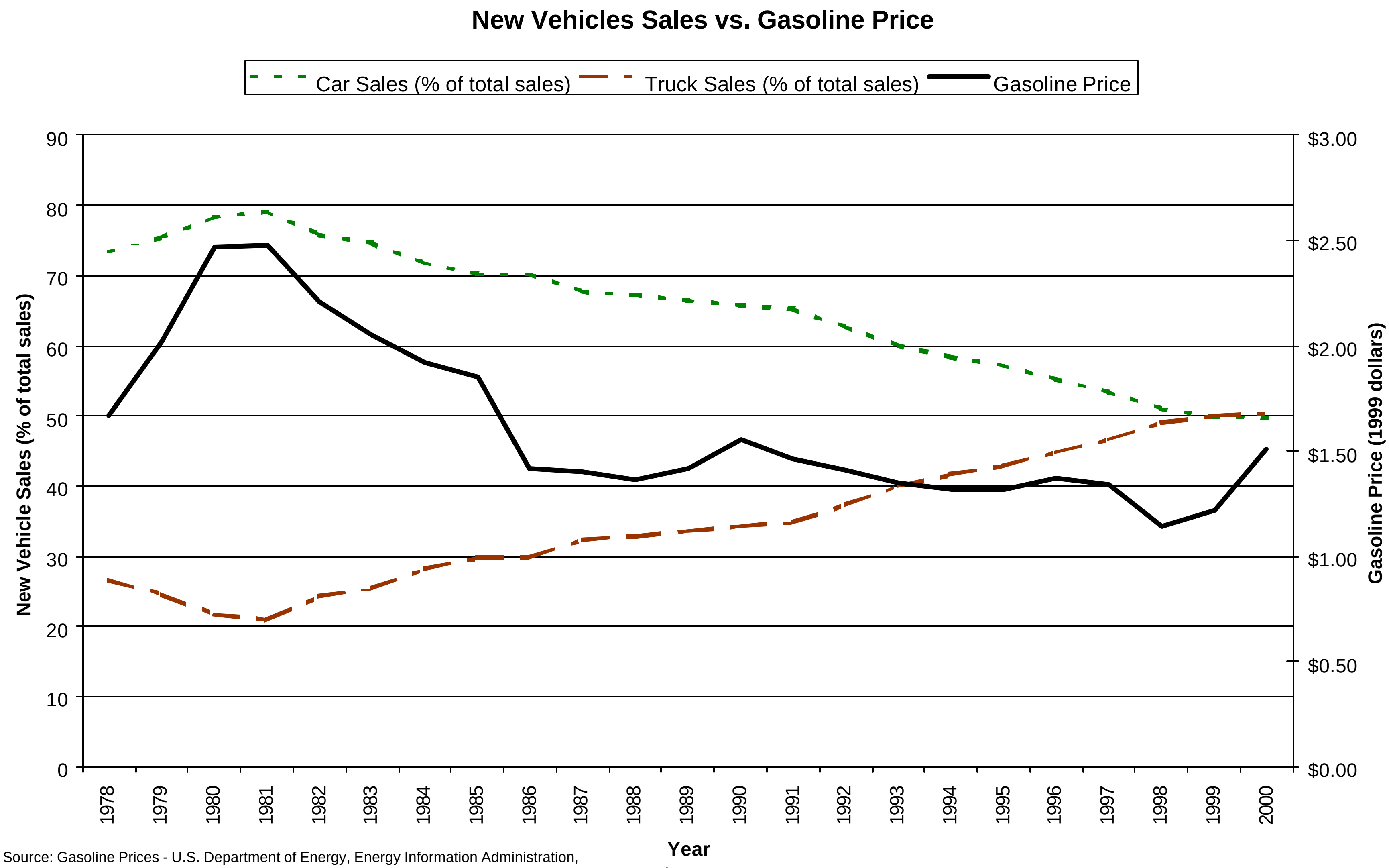

Figure 3

Source: Gasoline Prices - U.S. Department of Energy, Energy Information Administration, Monthly Energy Review, 2001, Washington, DC, Table 9.4.
New Vehicle Sales - 2001 Ward's Motor Vehicle Facts & Figures, "U.S. Retail Sales of Cars and Trucks"

Question III.12 - Actual and Projected U.S. Light Truck Sales

		Year	
Drive	**NHTSA Class**	**2001**	C
4x2	Compact Utilities	205,900	
	Compact Cargo Vans	4,093	
	Compact Passenger Vans	231,994	
	Compact Pickup	261,674	
	Standard Cargo Vans Heavy	1,770	
	Standard Cargo Vans Light	30,623	
	Standard Passenger Vans Light	5,840	
	Standard Pickup Light	354,490	
	Standard Utilities	115,711	
4X4	Compact Utilities	277,125	
	Compact Pickup	139,780	
	Standard Pickup Light	232,766	
	Standard Utilities	135,983	
0-8500# Total		1,997,749	
8500-10000# estimate	Standard Pickup Heavy	183,234	
	Standard Cargo Vans Heavy	117,026	
	Standard Utilities Heavy	65288	

C = confidential

Question III. 14. Please provide your companies projection for US gasoline and diesel prices.

Fuel Price Forecast

United States
Retail Gasoline Prices

	Real		**Nominal**	
	Regular Unleaded *2000 $/gal*	Diesel *2000 $/gal*	Regular Unleaded *$/gal*	Diesel *$/gal*
2005	$1.39	$1.36	$1.58	$1.54
2006	$1.39	$1.36	$1.62	$1.58
2007	$1.40	$1.36	$1.66	$1.62
2008	$1.40	$1.37	$1.71	$1.66
2009	$1.40	$1.37	$1.75	$1.71
2010	$1.41	$1.37	$1.80	$1.76